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Jumppanen Andersen, Kaija; Sørensen, Carlo Sass; Piontkowitz, Thorsten

Publication date:
2017

Document Version
Publisher's PDF, also known as Version of record

Paper ID 345
Poster Board N°4

Coastal Flood Protection Management Under Uncertainty – the Danish Case

Andersen, Kaija Jumppanen (1); Sørensen, Carlo (2,1); Piontkowitz, Thorsten (1)

1: Danish Coastal Authority, Denmark; 2: DTU Space, Denmark

E-Mail: kja@kyst.dk

In Denmark, the responsibility of coastal climate adaptation and flood protection lies with the municipalities and private house owners, while the national state agency, Danish Coastal Authority (DCA), must obtain a national overview of the flood risk in the coastal zone to guide the communities in their planning of flood risk management and flood protection measures. However, the flood challenge is never as simple as expected as flooding may occur from several sources and with different probabilities. In the community process of planning for coastal flood protection, DCA must ensure that measures do not create new challenges with flooding from other sources. For this, DCA must maintain a detailed knowledge of the numerous factors affecting the flood hazard, separately or jointly, so the potential future flood hazard can be assessed along the entire and diverse Danish coastline. As the flood hazards are governed by uncertainties, focal points to the DCA are to communicate these uncertainties in a form that supports community planning.

Looking exclusively at current coastal flooding hazards, uncertainties arise e.g. from the evaluation of tide gauge measurements and historical events in extreme value analysis, from alongshore variation in waves and water levels, and from river, groundwater and ocean water level interactions. Additional uncertainties arise from climate change models and scenarios, and natural system changes where regional or local projections of mean sea level, storminess, precipitation, storm surges and future return water levels etc. are needed. In order to optimize flood protection and risk management it is thus important to understand the causes of uncertainty and to act on a classification of 'uncertainty distributions' rather than from the median of projected changes alone.

The paper presents flood hazard mapping from a number of Danish locations based on revised extreme sea level statistics and the RCP8.5 scenario (Grinsted et al, 2015) that include multiple additional factors and their corresponding uncertainties affecting current and future flood hazards. From this the paper discusses challenges and national opportunities in providing for a diverse planning and optimal coastal flood management in time and space based on an intensified dialogue across levels of governance.

Grinsted, Jevrejeva, Riva, Dahl-Jensen (2015). Sea level rise projections for Northern Europe under RCP8.5, Clim. Res., vol. 64 doi:10.3354/cr01309

Keywords: Flood hazard, Uncertainty, Coastal planning, Climate change, Flood risk management